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Water Preserve Area Feasibility Study – Tentative Selected Plan

The following components have been identified as being located within the boundaries of the Water Preserve Areas. The component descriptions for the Tentative Selected Plan have been modified from D13R (recommended plan for the C&SF Comprehensive Review Study), and from Other Project Elements (OPEs). These components have been outlined in the component descriptions in a very conceptual way. Some additional level of incidental design has been expended on several of the components in order to allow them to be included in the subregional models. It is noted that not all components listed are recommended in the tentative selected plan.

The WPA Study Team has committed to the inclusion of fish & wildlife refugia/habitat/features where the component design allows this without compromising the function/purpose/intent of the component. The actual fish & wildlife features have been designed as part of the tentative selected plan.

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Palm Beach County

Broward County

WCA-1

WCA-2

WCA-3

Broward County

Miami-Dade County

WCA 2B Flows to CLBSA
(YY)

WCA 3 Flows to CLBSA
(ZZ)

Central Lake Belt
Storage Area
(L-30 Canal Conveyance)
(S)

Strazzulla Wetlands
(OPE)

C-16

TPK

Hillsboro Impoundment
(M)

Hillsboro Canal

North New River Improvements
(SS P2)

North New River Canal

C-11 Impoundment
(Q)

C-11

WCA 3A/3B Levee
Seepage Management
(O)

C-9 Impoundment
(R)

C-9

North Lake Belt
Storage Area
(Turnpike Deliveries)
(XX)

26

TPK
EXT

Dade-Broward
Levee & Canal
(BB)

C-4

WPA Feasibility Study
Tentative Selected Plan
Location Map 1

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Strazzulla Wetlands - (OPE)

Geographic Region: Water Preserve Area – Palm Beach County

Component Title: Strazzulla Wetlands - SEE WPA COMPONENT MAP 2

Purpose: Provide a hydrological and ecological connection to the Loxahatchee National Wildlife Refuge and expand the spatial extent of protected natural areas.

Intent: The additional lands to be purchased combined with the lands acquired are acting as a buffer between higher water stages to the west and lands to the east that must be drained. This increase in spatial extent provides vital habitat connectivity for species that require large unfragmented tracts of land for survival. It also contains the only remaining cypress habitat in the eastern Everglades and is one of the few remaining sawgrass marshes located adjacent to the coastal ridge. This area provides an essential Everglades landscape heterogeneity function.

Design and operation details:

- 1) A three to five foot high berm (five foot high along the southern end) is constructed along the northern and eastern boundaries of the property to reduce runoff, losses to the east, and allow deeper water depths.
- 2) A 300 cfs control structure in Lake Worth Drainage District (LWDD) L-23W canal consists of gated culverts. The structure controls the LWDD L-23W canal at the same elevation as the L-40 borrow canal when it is greater than elevation 15.8 feet NGVD. When L-40 is less than elevation 15.8 feet NGVD, the structure is operated to control L-23W at the same elevation as the LWDD canal system.
- 3) A slurry wall is constructed along the northwest boundary of Strazzulla to reduce seepage from Strazzulla. The slurry wall begins at the L-40 levee and extends east to the western plug in the Acme C-26 canal (length approximately 1 mile). The wall extends to a depth of –10 feet NGVD. The purpose of the slurry wall is to reduce or eliminate seepage from Strazzulla wetlands northward to Acme Basin B.
- 4) LWDD 9S canal will be relocated along the eastern perimeter of the wetlands from 116th Terrace South to reconnect to the L-23W canal.
- 5) This feature also includes the acquisition of approximately 3335 acres of land adjacent to WCA 1 including the Strazzulla Tract.

Location: East of WCA 1 in central Palm Beach County

Counties: Palm Beach

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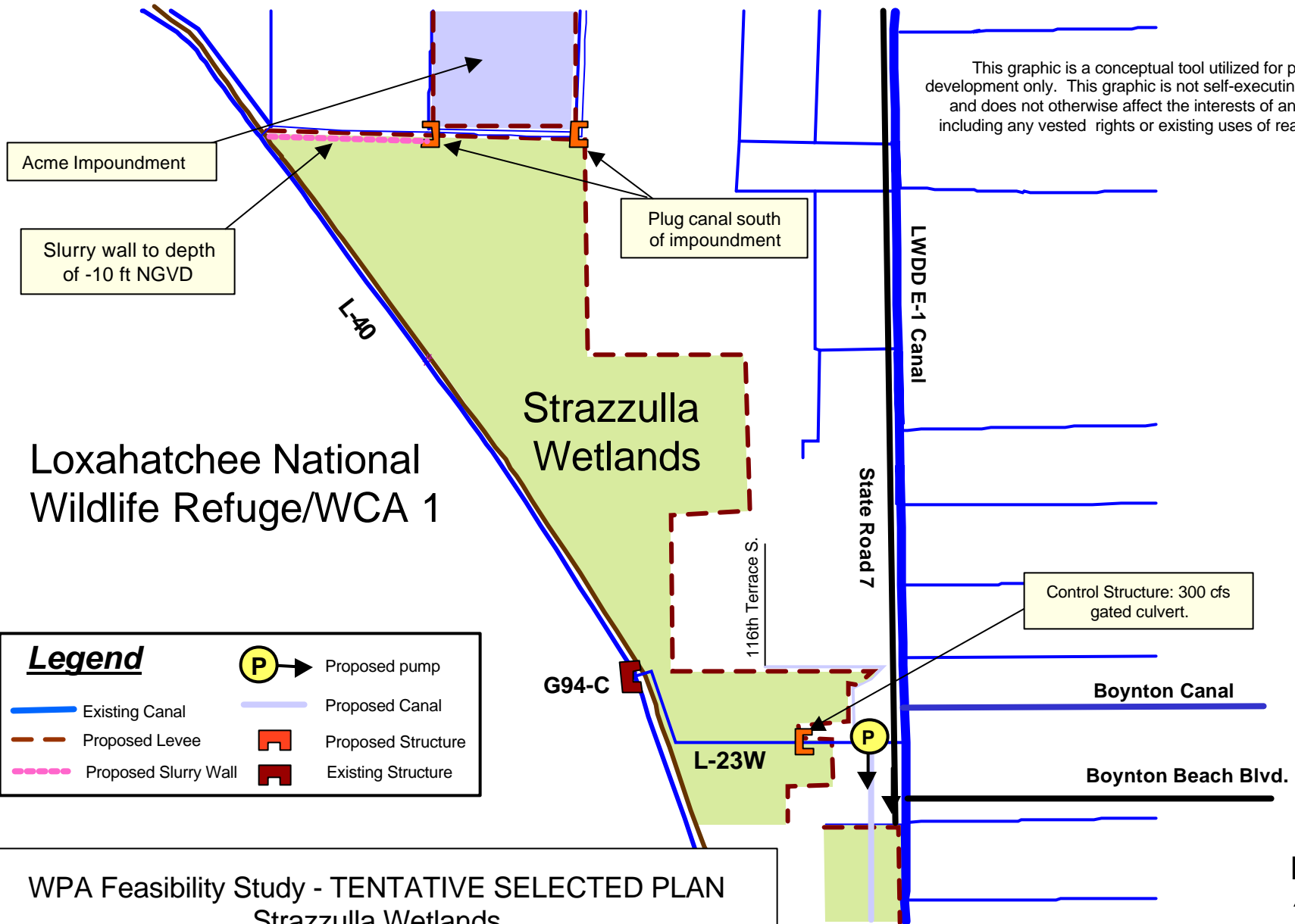
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Assumptions and related considerations:







- 1) Water supply deliveries to LWDD via L-23W canal are not interrupted by the operation of the proposed control structure.
- 2) This feature also includes the acquisition of approximately 3335 acres of land adjacent to WCA 1 including the Strazzulla Tract.
- 3) Telemetry systems are required for all operable structures.

Summary of modifications from D13R: Construction of a three to five foot high berm along the northern and eastern boundaries and a 300 cfs control structure in LWDD L-23W. A slurry wall extends from the L-40 Levee east to the western plug in Acme C-26 canal at Acme Basin B Impoundment penetrating to a depth of –10 feet NGVD. Seepage from the Acme Basin B Impoundment is allowed southward into northern Strazzulla by isolating the Acme C-26 canal along the southern border of the impoundment.

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Legend

	Proposed pump
	Existing Canal
	Proposed Levee
	Proposed Slurry Wall
	Proposed Structure
	Existing Structure

WPA Feasibility Study - TENTATIVE SELECTED PLAN
Strazzulla Wetlands
WPA Component Map 2

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component M

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: Hillsboro Impoundment – SEE WPA COMPONENT MAP 3

Purpose: Water supply storage impoundment to supplement water deliveries to the Hillsboro Canal during the dry season. The deliveries will be used to prevent saltwater intrusion, provide wellfield recharge and environmental deliveries to isolated wetlands. The storage area will reduce seepage from the adjacent natural areas, improve water quality and provide some measure of flood protection.

Operation: The impoundment fills during the wet season from excess water backpumped from the Hillsboro Canal. Water releases back to the Hillsboro Canal to help maintain canal stages during the dry season. If water is not available in the impoundment, existing operating rules for water delivery to this region apply. Aquifer Storage and Recovery (ASR) is proposed in conjunction with the impoundment to improve water supply during dry seasons and droughts. Thirty (30), 5-MGD ASR injection wells are included for a total of 150-MGD (230 cfs) capacity. Water from the Hillsboro Impoundment is injected into the ASR wells when stages in the impoundment are greater than 12.5 feet NGVD (1-foot of depth). Water is released from the impoundment and is recovered from the ASR wells when stages in the Hillsboro Canal are less than 7.0 feet NGVD to help maintain canal stages during dry periods.

The impoundment is compartmentalized into two cells, located north of the Hillsboro Canal. The total acreage of the impoundment is 1660 acres. North Springs Improvement District (NSID) discharges are redirected north to the impoundment via the L-36 borrow canal and the proposed inflow pump station.

Detailed design and operation:

- 1) 1660-acre impoundment is divided into two compartments, located north of the Hillsboro Canal. The western compartment is 836 acres in size. The eastern compartment is 824 acres in size. Each compartment has a maximum water depth of 8 feet. An internal levee separates the two compartments. Transfer of flow between the compartments is accomplished by a set of gated culverts.
- 2) Inflow: The inflow pump station in the Hillsboro Canal provides the total inflow rate of 1500 cfs.
- 3) Discharge: A 700 cfs outflow structure is located in the western compartment and discharges to the Hillsboro Canal. This structure consists of three gated culverts, each 4-feet in diameter and 70 feet long.
- 4) There are two operational scenarios.
 - (1) On-peak operations: The impoundment fills during the wet season with excess water backpumped from the Hillsboro Canal and NSID via the L-36 borrow canal. A 1500 cfs inflow pump station in the Hillsboro Canal turns on

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Water Preserve Area Feasibility Study – Tentative Selected Plan

when the stage in the Hillsboro Canal reaches elevation 7.7 feet NGVD and turns off when the canal stage drops to elevation 7.0 feet NGVD. The pump also turns off when the stage in the impoundment north of the Hillsboro Canal reaches elevation 19.0 feet NGVD (8 feet deep).

(2) Off-peak operations: A 700 cfs outflow structure is located in the western compartment and discharges to the Hillsboro Canal. The structure discharges when the Hillsboro Canal stage drops below elevation 7.0 feet NGVD and stops discharging when the canal reaches elevation 7.5 feet NGVD. The water stored in the impoundment and ASR storage system is used to meet the following prioritized demands: LWDD, C-14, C-13 and North New River.

- 5) Operational flexibility for the component is provided by interconnecting the compartments by culverts. Two structures, each containing two, 72" diameter CMP culverts, interconnect the northwestern and northeastern compartments. These interconnects allow water to be transferred between compartments.
- 6) A 500 cfs emergency overflow spillway is designed as a lower section of the levee to maintain levee integrity. The spillway invert elevation is 1 foot above the maximum normal operating elevation of the impoundment and discharges into the Hillsboro Canal.
- 7) Thirty (30), 5-MGD ASR injection wells (total capacity 150-MGD or about 230 cfs) are located around the perimeter of the impoundment. Ten (10) additional wells have been added to increase the withdrawal capacity to 200-MGD (310 cfs) which improves the effectiveness of the ASR storage system. Water is supplied for injection into the ASR wells via horizontal supply wells and toe drains located inside the impoundment. Water from the horizontal supply wells injects into the ASR wells when stages in the impoundment are greater than 12.5 feet NGVD (1.0 foot of depth).
- 8) The conveyance of Hillsboro Canal is increased by deepening the cross section from the inflow structure at the impoundment eastward to LWDD E-1 canal. This will enable additional flows from the western Hillsboro Canal basin to be backpumped into the impoundment.
- 9) A canal running along the east side of the impoundment (north of the Hillsboro Canal) collects seepage where it is directed south to the Hillsboro Canal through a gated culvert (100-cfs capacity).

Location: The Water Preserve Area Land Suitability Analysis previously identified 1660-acre site, north of the Hillsboro Canal and southeast of WCA-1.

Counties: Palm Beach

Assumptions and related considerations:

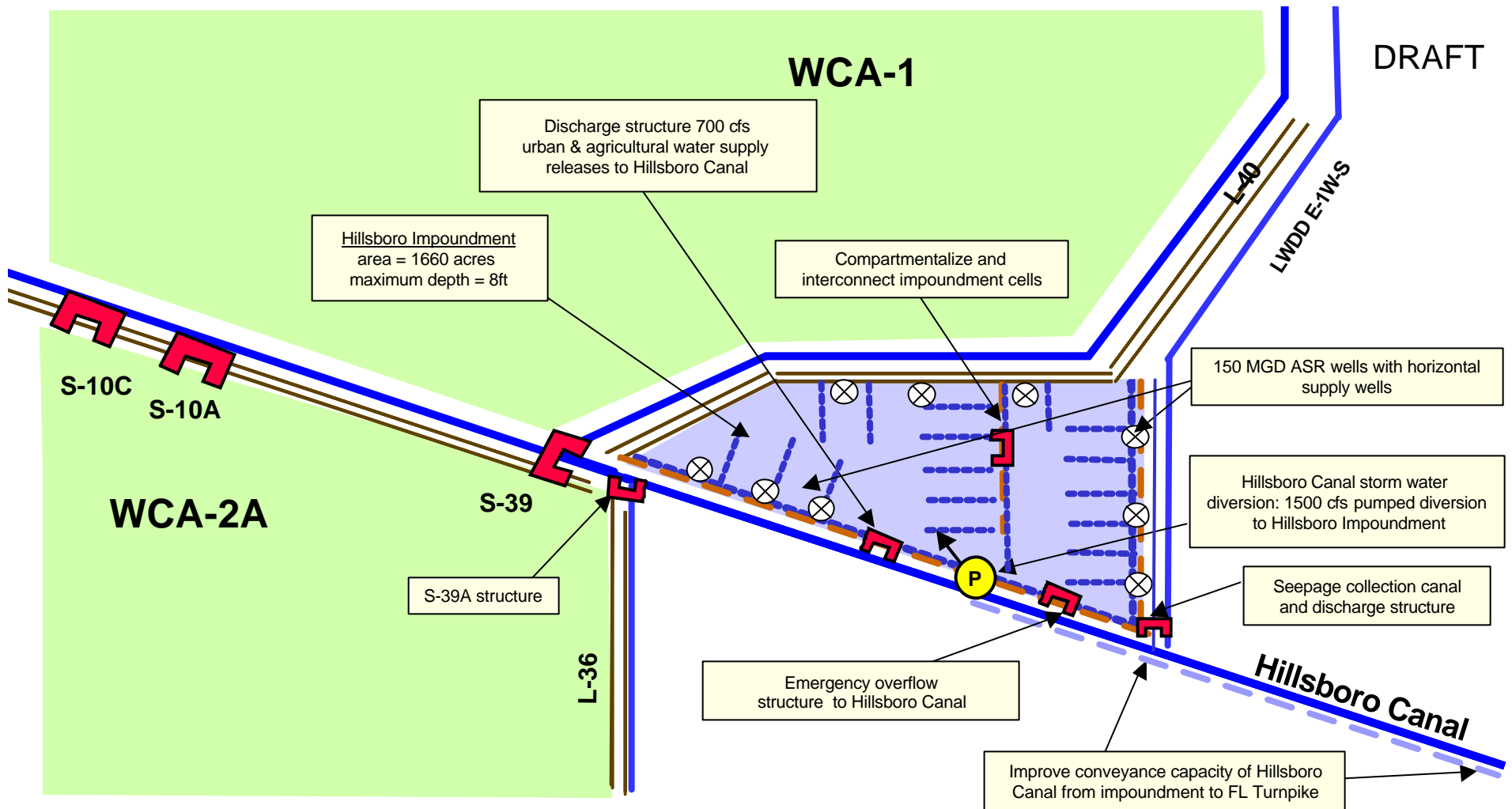
- 1) Recovery rate of 70 percent for water stored by ASR.
- 2) Telemetry systems are required for all operable structures and pump station.

Summary of modifications from D13R: The impoundment footprint is modified to 1660 acres with a maximum storage depth of 8 feet and compartmentalized to optimize operations and reduce levee height requirements. The inflow pump is increased to 1500 cfs and Hillsboro Canal conveyance is also increased from the

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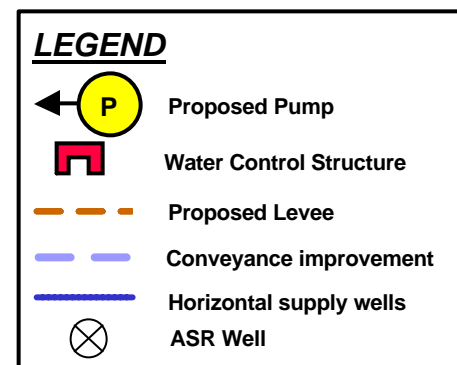
Water Preserve Area Feasibility Study – Tentative Selected Plan

pump station eastward to LWDD E-1 Canal to capture additional flows. The seepage collection system is modified. The ASR supply wells are modified to horizontal wells and toe drains and ten (10), 5-MGD ASR wells are added to increase the withdrawal capacity to 200-MGD (310 cfs). NSID discharges are redirected north into the Hillsboro Canal via the L-36 borrow canal.



**WPA Feasibility Study - TENTATIVE SELECTED PLAN
Hillsboro Impoundment and ASR
WPA Component Map 3**

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component YY

Geographic Region: Water Conservation Area -Water Preserve Area - Lake Belt

Component Title: Divert WCA 2 flows to Central Lake Belt Storage - SEE WPA COMPONENT MAP 4

Purpose: Capture excess water in Water Conservation Area (WCA) 2B to reduce stages above desired target levels in WCA 2B and to divert water through the improved L-37 and L-33 borrow canals to 1) Northeast Shark River Slough (NESRS) to meet targets, or 2) Central Lake Belt Storage Area.

Operation: Surface water in WCA 2B above target levels overflows through three structures along L-35 and L-35A to the North New River Canal. It is pumped to the L-37 borrow canal along with seepage from WCA 2B. The North New River Canal, L-37 and L-33 borrow canals are improved to accept this additional flow along with the seepage collected from WCA 3. This water is pumped to NESRS if it is below target levels or into a lined reservoir to be located south of the confluence of the L-33 borrow canal and the C-6 Canal referred to as the Central Lake Belt Storage Area (CLBSA). SEE COMPONENT S.

Design and operation detail:

- 1) Construct three diversion structures with 120 cfs capacity @0.5 feet of head and 350 cfs capacity @4.0 feet of head along the southern perimeter of WCA 2B to pass flows greater than targets.
- 2) Structure S-124 is removed. A basin divide structure is located immediately downstream of the confluence of L-35A and L-35 borrow canals. It has a control elevation of 4.25 feet NGVD in order to separate WCA 2B overflow from water supply deliveries made southeast in the North New River Canal.
- 3) Construct a divide structure northeast of the easternmost WCA 2B diversion structure with a crest at elevation 6.3 feet NGVD to separate WCA 2B flows directed south.
- 4) 1500 cfs pump station to divert overflow and seepage from the L-35 borrow canal to the L-37 borrow canal. Pump on when water levels in WCA 2B are 1.25 feet above target and pump off when water levels in WCA 2B drop below 1.0 foot above target.
- 5) Culvert with 1500 cfs capacity to pass flows generated by both seepage collection in the L-35A and L-35 borrow canals and flows above targets in WCA 2B from the L-38 east borrow canal to the L-37 borrow canal.
- 6) Improve conveyance of L-37 and L-33 borrow canals to 2000 cfs to handle WCA 2B flows plus seepage from WCA 3.
- 7) Remove S-9XN and S-9XS.

Location: The overflow structures are located along the southern levee of WCA 2B. L-37 and L-33 borrow canal improvements are located east of the protective

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Water Preserve Area Feasibility Study – Tentative Selected Plan

levees and 0.5 mile west of US Highway 27 between the North New River Canal and the Miami Canal.

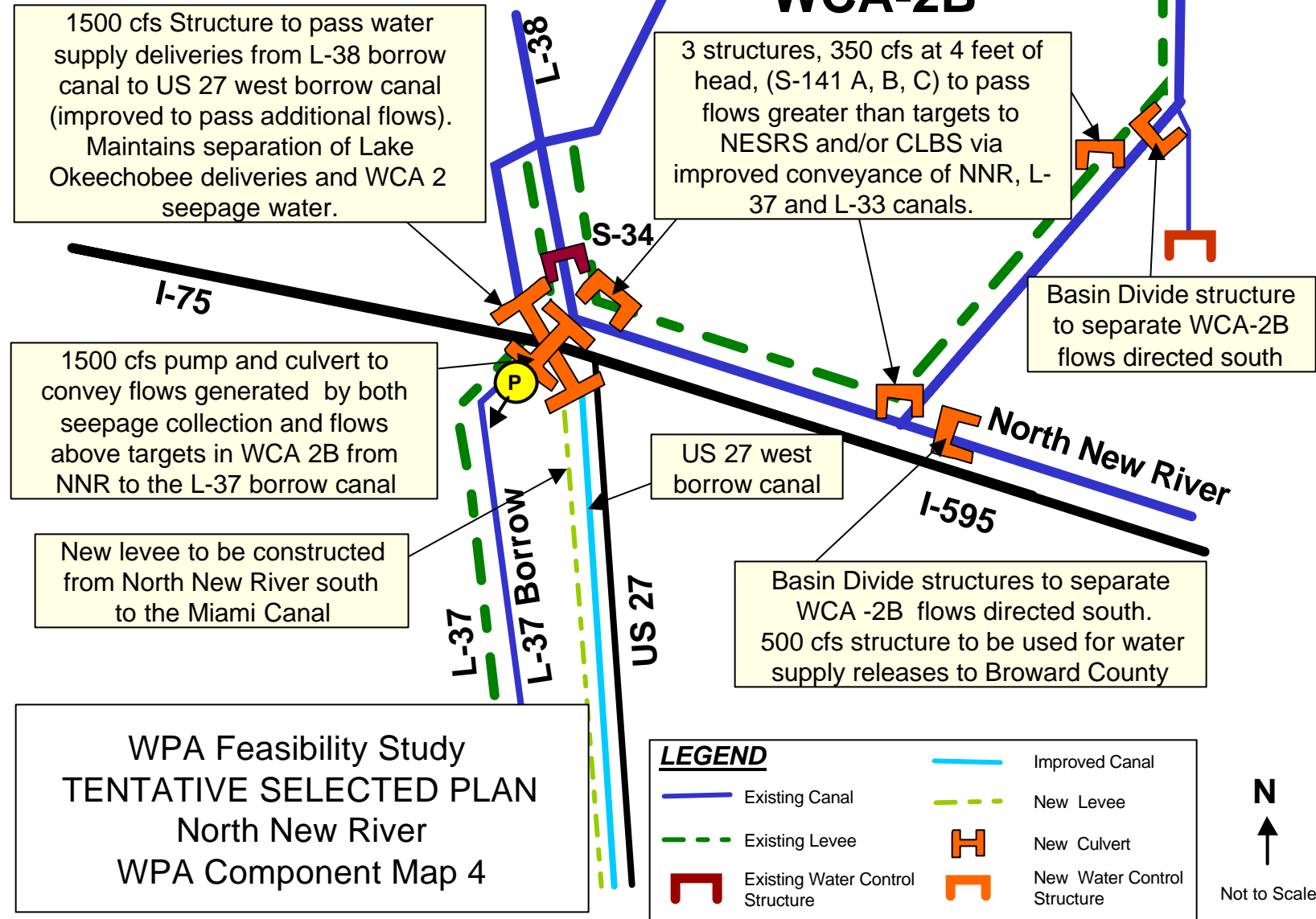
Counties: Broward

Assumptions and related considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems are required for all operable structures and pump stations.

Summary of modifications from D13R: Conveyance of L-37 and L-33 borrow canals reduced to 2000 cfs.

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Component O

Geographic Region: Water Preserve Area - Broward County

Component Title: Water Conservation Area (WCA) 3A and 3B Levee Seepage Management – SEE WPA COMPONENT MAPS 5 and 6

Purpose: Reduce seepage from WCA 3A and 3B to improve hydropatterns within the WCAs by allowing higher water levels in the borrow canals and maintaining longer inundated duration within the marsh areas that are located east of the WCAs and west of US Highway 27. Seepage from the WCAs and marshes is collected and directed south into the Central Lake Belt Storage Area. This maintains flood protection and the separation of seepage water from urban runoff originating in the Western C-11 basin and Lake Okeechobee water supply deliveries.

Operations: The L-37 and L-33 borrow canals are held at higher stages as part of the WCA 3A and 3B seepage management system. The canals are also used to convey flows as part of the WCA 2B diversion flow system (Component YY). Seepage and canal flows collected in the L-37 and L-33 borrow canals are directed south to the Northeast Shark River Slough (NESRS) to meet its demands; to the Central Lake Belt Storage Area for storage; or returned to WCA 3A through the proposed critical project pump S-9A.

Design and operation detail:

- 1) New levees are constructed west of US Highway 27 from the North New River Canal to the Miami (C-6) Canal. This provides a separation of seepage water from the urban runoff.
- 2) The northern Everglades Buffer Strip, that runs parallel to the L-37 borrow canal, is controlled via a gated spillway at an elevation of 7.5 feet NGVD, wet season and 6.5 feet NGVD, dry season. A new 50 cfs gravity control structure directs water which can pond in the buffer strip near the C-11 Canal into the L-37 borrow canal just east of the S-9 pump station. The discharge into the C-11 Canal is diverted or returned to WCA 3A by the S-9A pump station (critical project).
- 3) The southern Everglades Buffer Strip, that runs parallel to the L-33 borrow canal, is controlled via a gated spillway at an elevation of 6.5 feet NGVD, wet season and 5.5 feet NGVD, dry season.
- 4) A divide structure is added in the C-11 Canal, east of US Highway 27 to maintain a headwater stage to reduce/control seepage from WCA 3A and to separate seepage water from urban runoff. Seepage water west of the divide structure is backpumped into WCA 3A by the new critical project pump station S-9A. Water from the C-11 west basin, east of the divide structure, is backpumped into the C-11 STA/Impoundment and may be diverted south to the North Lake Belt Storage Area and C-9 STA/Impoundment as storage availability exists in either facility.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Location: Seepage collected in borrow canals along the existing eastern protective levees adjacent to WCA 3. The divide structure is located in the C-11 Canal east of US Highway 27.

Counties: Broward

Assumptions and related considerations:

- 1) The seepage from the Water Conservation Areas meets the water quality standards necessary to achieve ecosystem restoration.
- 2) Telemetry systems are required for all operable structures and pump stations.

Summary of modifications from D13R: Control elevations for L-33 and L-37 borrow canals are modified to improve the hydroperiod in the northern and southern Everglades Buffer Strip with the addition of two control structures. A control structure to transfer water from the Everglades Buffer Strip to WCA 3A via the S-9A pump is added.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component Q

Geographic Region: Water Preserve Area - Broward County

Component Title: C-11 Impoundment - SEE WPA COMPONENT MAP 5

Purpose: Divert untreated runoff from the western C-11 basin that is presently discharged into Water Conservation Area (WCA) 3A into the C-11 Stormwater Treatment Area (STA) / Impoundment prior to sending it south to the North Lake Belt Storage Area (NLBSA).

Operation: Runoff in the western C-11 basin that was previously backpumped into Water Conservation Area 3A is diverted into the C-11 STA/Impoundment and the NLBSA. If storage capacity is not available in the impoundment or NLBSA then the S-9 pump station is used to provide flood protection for the western C-11 basin and runoff is pumped into WCA 3A. The S-9 seepage divide structure (S-381) is operated to reduce the groundwater elevation fluctuations and reduce seepage in the western C-11 Canal.

Design and operation details:

- 1) Impoundment/STA: 1730 acres divided into two compartments. The northern compartment is 209 acres in size with a maximum water depth of 2 feet. The 2-foot maximum water depth for this compartment is proposed to accommodate the relocation and consolidation of the mitigation areas for Arvida II, Arvida III and the City of Weston. The intent is to manage the northern compartment in such a way as to provide the wetland mitigation function. The southern compartment is 1507 acres in size with a maximum water depth of 4 feet. A perimeter levee surrounds the impoundment with a 7-foot high internal levee separating the two compartments. Transfer of flow between compartments is accomplished by 2 sets of gated culverts each consisting of two, 60-foot long, 72-inch diameter culverts. The buffer marsh/wetland enhancement area located north of the proposed impoundment will be used to mitigate seepage from the impoundment and provide a buffer between the impoundment and urban development.
- 2) Canal improvements: 2500 cfs diversion canal replaces the borrow canal located west of US Highway 27 between the C-11 and C-9 canals. Conveyance capacity improvements for the C-9 Canal are required between S-30 and the diversion structure into NLBSA.
- 3) Inflows: A 2500 cfs capacity inflow pump in the C-11 Canal directs runoff into the C-11 STA/Impoundment. For dry season operation, the pump turns on at elevation 4.0 feet NGVD and turns off at elevation 3.7 feet NGVD or when the impoundment reaches 4 feet of depth. The wet season pump on elevation is 3.9 feet NGVD and off elevation is 3.5 feet NGVD or when the impoundment reaches 4 feet of depth.
- 4) Discharges: A 2500 cfs structure discharges from the impoundment into the improved, US Highway 27 west borrow canal when stages reach 4.0 feet

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Water Preserve Area Feasibility Study – Tentative Selected Plan

NGVD. The northern 2-foot area discharges at a rate up to 100 cfs into the eastern seepage canal.

- 5) There are two operational scenarios.
 - (1) On-peak operations: Stormwater runoff that is currently backpumped into WCA 3A in the western C-11 basin is diverted into the C-11 STA/Impoundment until full, then sent to the C-9 STA/Impoundment until full and finally to NLBSA. If storage capacity is not available in the C-11 STA/Impoundment, C-9 STA/Impoundment or NLBSA, then the S-9 pump station is used to provide flood protection for the western C-11 basin and runoff is pumped into WCA 3A.
 - (2) Off-peak operations: Water is supplied from the impoundment to maintain the western C-11 Canal and recharge south Broward County wellfields. To improve groundwater elevations in the eastern C-11 basin and Pond Apple Slough (at S-13A) during dry seasons, S-13A is opened and deliveries from the C-11 STA/Impoundment are made when the stage at S-13 is less than 3.5 feet NGVD. If water is not available from the C-11 STA/Impoundment, then deliveries are made by opening S-381 and allowing seepage water to recharge the basin and prevent excessive dry outs.
- 6) Seepage is collected and returned to the impoundment via a seepage collection system located on the north and west boundaries of the impoundment. Seepage east of the impoundment is controlled by the expansion of the eastern seepage canal which is directly connected to the C-11 Canal.
- 7) An emergency overflow spillway is designed as a lower section of the levee to maintain impoundment levee integrity. The emergency overflow spillway invert elevation is 1 foot above the maximum normal operating elevation. The spillway discharges into the C-11 Canal west of the divide structure.

Location: The diversion canal is located west of US Highway 27 between the C-11 and the C-9 Canals. The C-11 STA/Impoundment is located northeast of the intersection of US Highway 27 and C-11 Canal.

Counties: Broward, Miami-Dade

Assumptions and related considerations:

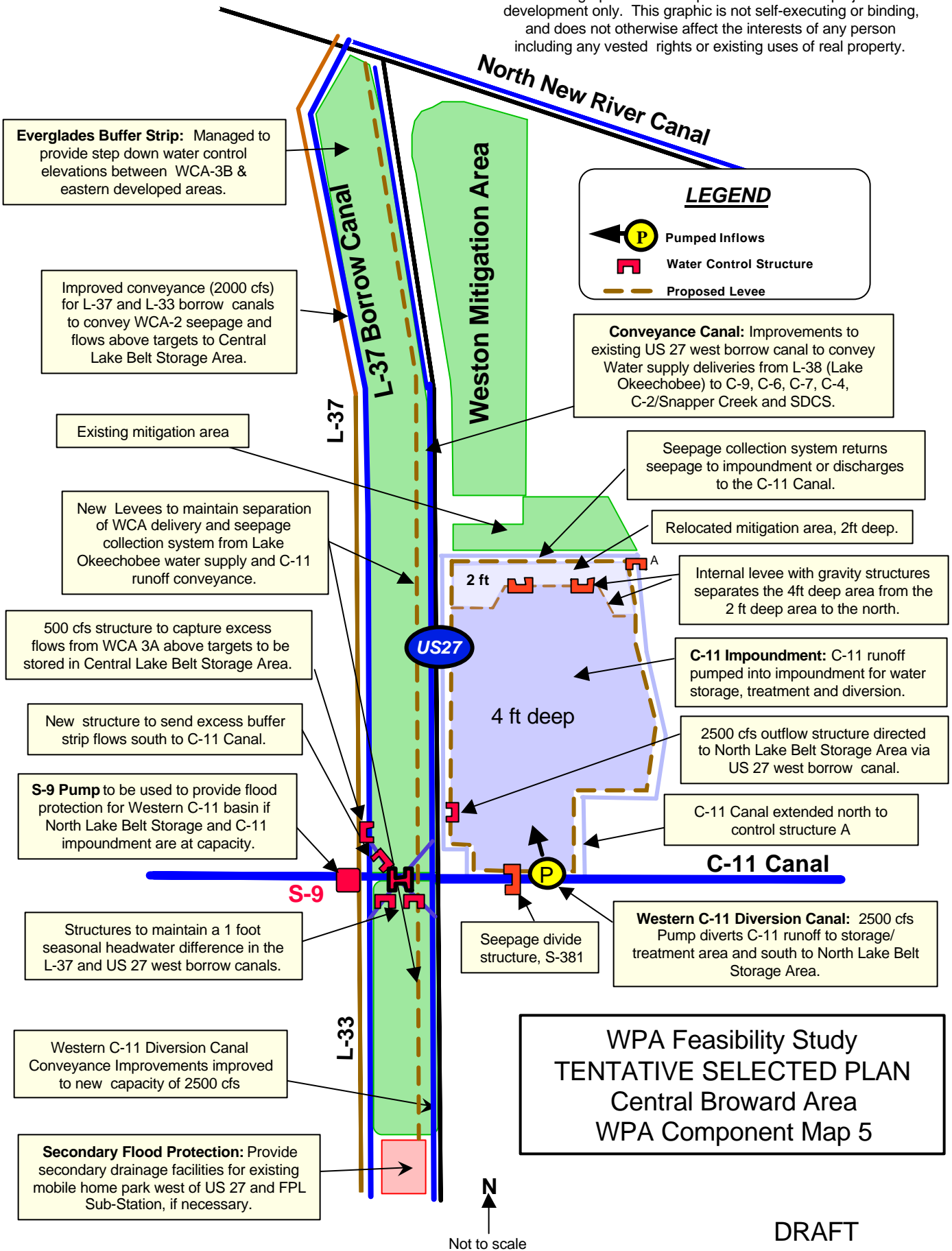
- 1) Flood protection component for FPL substation and mobile home park may be needed. For each facility, a 60 cfs pump with an on elevation of 6.0 feet NGVD and an off elevation of 5.0 feet NGVD is proposed.
- 2) Telemetry systems are required for all operable structures and pump stations.
- 3) Initially the C-11 STA/Impoundment is operated as an impoundment. This operation continues until the NLBSA is functional. At which time, the intended use of the impoundment is to provide water quality treatment as necessary.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Summary of modifications from D13R: The impoundment footprint is modified and includes two interconnected compartments. The operation of the seepage collection system is modified. A new seepage collection canal and pump are added along the western perimeter of the impoundment east of US Highway 27. The seepage canal along the eastern boundary is connected to the C-11 Canal and helps improve seepage. The 2500 cfs outflow structure is relocated along the southwest side of the impoundment. The operations for the C-11 STA/Impoundment and S-13A are changed to provide dry season flows to the eastern C-11 basin and Pond Apple Slough. Recharge to the South Broward County wellfields are provided from C-11 Canal.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component R

Geographic Region: Water Preserve Area - Broward County

Component Title: C-9 Stormwater Treatment Area (STA)/Impoundment - SEE WPA COMPONENT MAP 6

Purpose: Treatment of water supply deliveries from the North Lake Belt Storage Area (NLBSA) to the C-9, C-6/C-7 and C-2/C-4 Canals. Runoff is backpumped into the NLBSA from the western C-9 basin and the western C-11 Canal. The C-9 STA/Impoundment provides treatment of urban runoff that is stored in the North Lake Belt Storage Area, groundwater recharge within the basin and seepage control of WCA 3 and buffer areas located west of the impoundment.

Operation: Excess water from the C-11 and C-9 basins is distributed to the NLBSA and C-9 Impoundment when there is available storage. In the dry season, water supply deliveries are provided to the C-9, C-6/C-7 and C-2/C-4 canals and to Biscayne Bay. Seepage from the C-9 STA/Impoundment is collected and returned to the impoundment. Aquifer Storage and Recovery (ASR) is proposed in conjunction with the impoundment to improve water supply during dry seasons and droughts. Twenty-five (25), 5-MGD ASR injection wells are included for a total of 125-MGD (194 cfs) capacity. Water from the C-9 STA/Impoundment is injected into the ASR wells when stages in the impoundment are greater than 5.5 feet NGVD (1 foot of depth). Water is released from the impoundment and/or is recovered from the ASR wells to meet water supply demands.

Design and operation detail:

- 1) Impoundment/STA: 1739 acres with a maximum water depth of 4 feet. A levee surrounds the impoundment.
- 2) Inflow structure: 1000 cfs pump (from NLBSA, to be resized as needed) SEE COMPONENT XX. Pump on when water supply deliveries are needed to C-9, C-6/C-7 and C-2/C-4 canals and to Biscayne Bay when the water level in the NLBSA is above -15.0 feet NGVD.
- 3) Outflow structure: Gravity structure with 1000 cfs capacity discharges to the C-9 Canal for water supply deliveries to the C-6/C-7, C-2/C-4 canals and Biscayne Bay.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

- 4) There are two operational scenarios:
 - (1) On-peak operations: Flows from the western C-11 and C-9 basins are distributed to NLBSA and C-9 STA/Impoundment where storage is available. Flows stop when the impoundment is full. The intent is to maximize the amount of water sent to the impoundment for storage in ASR.
 - (2) Off-peak operations: Water supply deliveries from the impoundment and ASR storage system are provided to the C-9, C-6/C-7, C-2/C-4 canals and to Biscayne Bay.
- 5) Seepage Collection: Seepage canals are located on the north, east and west boundaries of the STA/impoundment. Three, 100-cfs pumps are used to direct seepage back into the 4 foot deep impoundment area. The seepage collection canal system is maintained between elevations 2.5 and 3.0 feet NGVD for the east, 4.5 and 5.0 feet NGVD for the west and 4.0 and 4.3 feet NGVD for the north.
- 6) Twenty-five (25), 5-MGD ASR injection wells (total capacity 125-MGD or about 194 cfs) are located around the perimeter of the impoundment. Eight (8) additional wells have been added to increase the withdrawal capacity to 165-MGD (255 cfs) which improves the effectiveness of the ASR storage system. Water is supplied for injection into the ASR wells via horizontal supply wells and toe drains located inside the impoundment. Water from the horizontal supply wells injects into the ASR wells when stages in the impoundment are greater than 5.5 feet NGVD (1.0 foot of depth). Water is recovered when stages in C-9 Canal are below 3.5 feet NGVD.
- 7) An emergency overflow spillway is designed as a lower section of the levee to maintain impoundment levee integrity. The emergency overflow spillway invert elevation is 1 foot above the maximum normal operating elevation. The spillway will discharge into the C-9 Canal.

Location: Site identified by Water Preserve Area Land Suitability Analysis, east of US Highway 27 and north of the C-9 Canal.

Counties: Broward

Assumptions and related considerations:

- 1) Additional treatment facility needed if stored water is backpumped into Water Conservation Area 3.
- 2) Telemetry systems are required for all operable structures and pump stations.
- 3) Initially the C-9 STA/Impoundment is operated as an impoundment. This operation continues until the NLBSA is functional. At which time, the intended use of the impoundment is to provide water quality treatment as necessary.

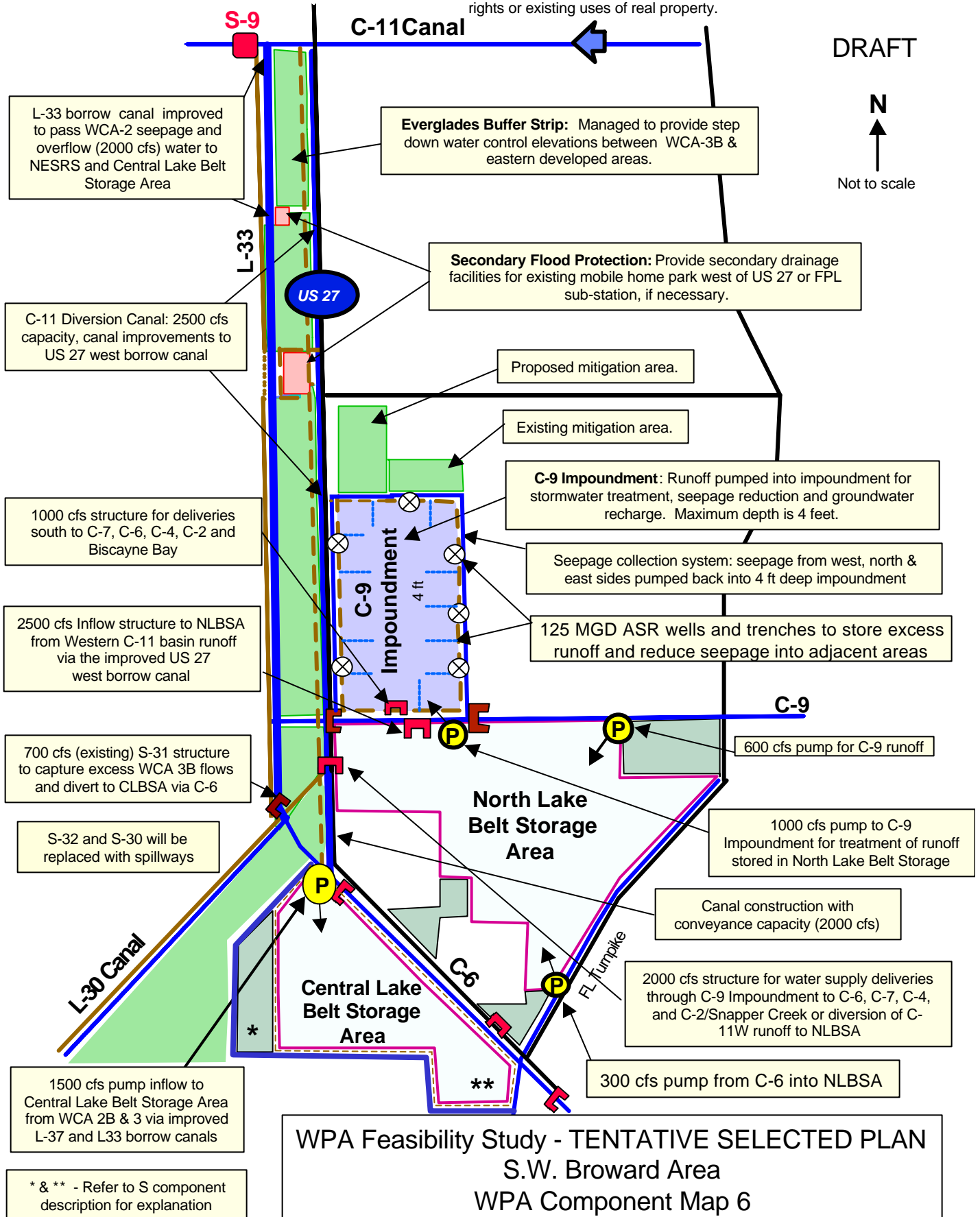
Summary of modifications from D13R: The footprint is modified to 1739 acres. An ASR system is included. The seepage collection system and inflow pump operation are modified.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component SS

Geographic Region: Everglades Agricultural Area (EAA) and Miami-Dade County

Component Title: North New River Improvements – SEE WPA COMPONENT MAPS 4,5 and 6

Purpose: Reroute water supply deliveries made to Miami-Dade County from the Miami and Tamiami Canals and Water Conservation Area (WCA) 3 to the North New River Canal due to the backfilling of the Miami Canal as part of the decompartmentalization of WCA 3.

Operation: Send water supply deliveries from Lake Okeechobee to Miami-Dade County southeast through the North New River Canal in the Everglades Agricultural Area (EAA) (L-20, L-19, L-18 borrow canals) to S-150. From the S-150 send deliveries into L-38W borrow canal and at the southern terminus of the borrow canal deliveries continue south through a 1500 cfs pump to the borrow canal along the west side of US Highway 27.

Design and operation detail:

- 1) Double the capacity of the North New River Canal (L-18) south of the proposed EAA Storage Reservoir (see Component G – not a component of the Broward groundwater model) to convey additional water supply deliveries to Miami-Dade County as necessary.
- 2) Double the capacity of S-351 and S-150 to pass additional water supply deliveries to Miami-Dade County as necessary.
- 3) Improve conveyance in the L-38W borrow canal to 2000 cfs as necessary.
- 4) Construct an inverted siphon with 1500 cfs capacity to pass water supply deliveries from the L-38 west borrow canal to the US Highway 27 west borrow canal. This maintains the separation of Lake Okeechobee water supply deliveries and WCA 2 seepage and overflow water.
- 5) Improve conveyance in the borrow canal on the west side of US Highway 27 between L-38W and the Miami Canal as necessary to pass the additional flows.
- 6) Pump intake at S-7 is lowered to elevation 8.0 feet NGVD.

Location: EAA and Water Conservation Area 3.

Counties: Palm Beach, Broward, and Miami-Dade

Assumptions and related considerations:

- 1) Operational flexibility is reduced since there is only one delivery route to Miami-Dade County (back-up routes have been eliminated).

Summary of modifications from D13R: No change from D13R

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component XX

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: North Lake Belt Storage Area (NLBSA) - SEE WPA COMPONENT MAP 6

Purpose: In-ground reservoir to capture a portion of stormwater runoff from C-6, western C-11 and C-9 basins. The in-ground reservoir with perimeter seepage barrier allows storage of untreated runoff without concerns of groundwater contamination. The stored water is used to maintain stages during the dry season in the C-9, C-6, C-7, C-4 and C-2 canals and to provide deliveries to Biscayne Bay to aid in meeting salinity targets.

Operation: Runoff from the C-6 basin (west of the turnpike), western C-11, and C-9 basins is pumped and gravity fed into the in-ground reservoir. Inflows stop when stages reach approximately elevation 5.0 feet NGVD (0 feet above adjacent land elevation).

Outflows for water supply are pumped into the C-9 Storm Water Treatment Area (STA)/Impoundment prior to delivery to the C-9, C-6, C-7, C-4 and C-2 canals.

Water from the reservoir can be withdrawn down to a stage of -15 feet NGVD (up to 20 feet of working storage & maximum head on the seepage barrier).

Prioritization of outflows: If water levels in the NLBSA are from between +5.0 feet NGVD and 0.0 feet NGVD, flows are discharged to Biscayne Bay via the C-2 Canal. If water levels in the NLBSA are from between 0.0 feet NGVD and -10 feet NGVD, flows are discharged to C-9, C-6, C-7, C-4 and C-2 canals only to prevent saltwater intrusion. If water levels in NLBSA drop to levels between -10 feet NGVD and -15 feet NGVD, discharge are limited to the C-9 Canal only to avoid water shortage restrictions.

The storage area is 4500 acres in size and is used to capture a portion of the runoff from the C-6, C-9 and C-11 basins. (Note: SFWMM simulation assumes 5120 acres of surface area. To simulate equivalent working storage volumes, the simulated water levels are higher from those prescribed here.)

Design and operation detail:

- 1) Reservoir: 4500 acres with subterranean seepage barrier extending down 120 feet below ground around the perimeter to enable drawdown during dry periods, prevent seepage and to prevent water quality impacts.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

- 2) Inflow structures: 2500 cfs gravity structure @ 0.5 feet head, from C-11W. 600 cfs pump from C-9 (pump on 3.0 feet NGVD and pump off 2.5 feet NGVD). 300 cfs pump (pump on 3.5 feet NGVD and pump off 3.0 feet NGVD) from C-6 Canal west of the proposed divide structure which consists of a gated spillway to maintain an upstream stage of 3.5 feet NGVD.
- 3) Outflow structures: 1000 cfs pump (pump on between +5.0 and –10.0 feet NGVD and pump off –10.0 feet NGVD or when the C-9 STA/Impoundment is 4 feet deep) to C-9 STA/Impoundment for treatment prior to deliveries to C-6, C-7, C-4 and C-2 to prevent saltwater intrusion in coastal canals. (Stormwater treatment area detention time requirements need to be determined. Pretreatment in reservoir may reduce size requirements of treatment area). Deliveries from NLBSA assumed to be divided as follows, 70 percent to C-9 STA/Impoundment, 10 percent to southwest Water Redistribution Area (WRA), 10 percent to south WRA and 10 percent to northeast WRA.
- 4) Southwest WRA design: 100 cfs inflow pump (pump on between 5.0 and –10.0 feet NGVD in NLBSA when water supply deliveries are required to C-6, C-4 and C-2 Canals), 100 cfs gravity discharge structure to the C-6 Canal and two, 180 cfs seepage control pumps on the perimeter seepage canal.
- 5) South WRA design: 100 cfs inflow pump (pump on between 5.0 and –10.0 feet NGVD in NLBSA when water supply deliveries are required to C-6, C-4 and C-2 Canals), 100 cfs gravity discharge structure to the C-6 Canal and two, 150 cfs seepage control pumps on the perimeter seepage canal.
- 6) East WRA design: 100 cfs inflow pump (pump on between 5.0 and –15.0 feet NGVD in NLBSA when water supply deliveries are required to C-9 Canal) and 100 cfs gravity discharge structure to the C-9 Canal.
- 7) A stage divide in the C-9 Canal is located east of the outflow structure from the C-9 STA/Impoundment. It consists of a gated culvert with a headwater stage of 5.5 feet NGVD and a tailwater stage of 2.5 feet NGVD and a capacity of 500 cfs. It passes Lake Okeechobee water supply deliveries to the C-9 Canal when other sources are not available.
- 8) Canal: 800 cfs canal capacity - Water supply discharges are routed to C-4/C-2 via a canal to be located east of the Snapper Creek Canal (Northwest wellfield protection canal system).
- 9) 2-300 cfs delivery structures, one each at the new canal's confluence with C-6 and C-4 for C-4/C-2 deliveries.

Location: Reservoir is located within the area proposed for rockmining by the Lake Belt Issue Team. It is sited north of Miami Canal (C-6) and South of the C-9 Canal to minimize impacts to the Northwest wellfield.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's Northwest Wellfield.
- 2) Treatment facility needed if stored water is backpumped to the Everglades.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

- 3) All water quality considerations are addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- 5) Limestone Filter Treatment system within the NLBSA may be developed through use of compartmentalization of rock mining excavation pattern.
- 6) Telemetry systems are required for all operable structures and pump stations.
- 7) Any specific water quality considerations regarding capture of C-6 basin runoff is addressed during the detailed design stage.

Summary of modifications from D13R: No change from D13R, except for relocation of water supply deliveries for South Dade Conveyance System to the Dade Broward Levee Canal.

Note: The WPA Team has recommended in the Preliminary Selected Plan the same component design as Alternative D13R. This is due to the many uncertainties with the technology and design. These uncertainties are expected to be resolved during the pilot study for the Lake Belt In-ground Reservoir. The WPA Team did investigate alternative component designs for the Lake Belt components – North Lake Belt Storage Area (XX) and Central Lake Belt Storage Area (S). These alternative designs consolidated the in-ground reservoir locations, revised storage depths and expanded the size of the proposed Water Redistribution Areas. These alternative designs function in a similar manner to the Alternative D13R designs (storage of equivalent volumes of water) and were used in the modeling of the WPA Preliminary Selected Plan. The Lake Belt In-ground Reservoir pilot project may utilize these alternative designs as the starting point for further study and investigation.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component ZZ

Geographic Region: Water Conservation Area -Water Preserve Area - Lake Belt

Component Title: Divert Water Conservation Area 3 flows to Central Lake Belt Storage Area – SEE WPA COMPONENT MAP 7

Purpose: Capture excess water in Water Conservation Area (WCA) 3A and 3B to reduce stages above target stages in WCA 3 and to divert it through modified structures at S-9 and S-31 to the Central Lake Belt Storage Area (CLBSA) via the L-37 and L-33 borrow canals.

Operation: When surface water in WCA 3B exceeds target depths by 0.1 feet, water is diverted to the CLBSA via the L-33 borrow canal. When surface water in WCA 3A near S-9 exceeds target depths by 1.0 foot, water is diverted to the CLBSA via the L-33 borrow canal.

Design and operation detail:

- 1) Outflow structures: A new 500 cfs structure located at the S-9 is constructed. It operates at 2.0 feet of head to deliver flows from WCA 3A to the L-37 borrow canal.

Location: The eastern levees of WCA 3.

Counties: Broward and Miami-Dade

Assumptions and related considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems are required for all operable structures and pump stations.

Summary of modifications from D13R: No change from D13R.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component S

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: Central Lake Belt Storage Area (CLBSA)– SEE WPA COMPONENT MAPS 6 and 7

Purpose: In-ground reservoir to receive excess water from Water Conservation Areas (WCA) 2B, 3A and 3B. The in-ground reservoir, with perimeter seepage barrier, allows storage of large quantities of water without groundwater seepage losses in this highly transmissive region. The water stored in CLBSA is provided to 1) Northeast Shark River Slough (NESRS), 2) WCA 3B and 3) Biscayne Bay when available.

Operation: Inflows from the L-33 borrow canal (Component ZZ) are through a 1500 cfs pump. Inflows stop when stages reach approximately elevation 21.0 feet NGVD (16 feet above adjacent land elevation).

Outflows for water deliveries are pumped through a polishing marsh cell prior delivery to NESRS via the L-30 borrow canal and a reconfigured L-31N borrow canal (Component U). Deliveries of water to NESRS to meet targets occur when NESRS dries below trigger levels and target hydroperiods simulations call for NESRS to be inundated. CLBSA delivers water to WCA 3B through a polishing marsh cell via the L-30 borrow canal to inundate the eastern area of WCA 3B to a 6 inch depth when triggers call for deliveries. This delivery occurs when WCA 3B dries below 6 inches above ground and target hydroperiods simulations indicate inundation in WCA 3B. When available, outflows are directed to Biscayne Bay through discharges to Snapper Creek at the Turnpike. SEE WPA COMPONENT MAP 7

Water supply from the reservoir can be withdrawn down to elevation –15.0 feet NGVD (up to 36 feet of working storage and maximum head on seepage barrier).

Prioritization of Operations: If water levels in the CLBSA are from between +21.0 feet NGVD and -15.0 feet NGVD, flows are discharged to NESRS. If water levels in the CLBSA are from between 21.0 feet NGVD and -10 feet NGVD, flows are discharged to WCA 3B. If water levels in CLBSA drop to levels between -10 feet NGVD and -15 feet NGVD, discharge is limited to the NESRS only to avoid water shortage restrictions.

The storage area is 5200 acres in size and is used to capture flows above Natural System Model (NSM) levels within WCA's 2B, 3A and 3B . (Note: SFWMM simulation assumes 5120 acres of surface area. To simulate equivalent working storage volumes, the simulated water levels are slightly lower from those prescribed here.)

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Design and operation details:

- 1) Reservoir: 5200 acres with subterranean seepage barrier extending down 120 feet below ground around the perimeter to enable drawdown during dry periods, to prevent seepage and to prevent water quality impacts on the adjacent Miami-Dade Northwest Wellfield.
- 2) Inflow structures: 1500 cfs pump (pump on between +21.0 and –15.0 feet NGVD) from the C-6 Canal. Pump is operated when stages in WCA 2A, 3A and 3B are above targets in those respective WCA's.
- 3) 1500 cfs gravity structure @ 0.5 feet head east of Krome Avenue south of the C-6 Canal to deliver WCA deliveries via L-37, L-33 borrow canals and S-31. This structure is opened whenever WCA 2B, 3A and 3B are above NSM levels and Lake Okeechobee deliveries are not being provided to the Dade-Broward Levee borrow canal just downstream of the structure on the C-6 Canal. This structure from C-6 Canal east of the intersection of L-33 borrow canal consists of a gated spillway to maintain an upstream stage of 7.0 feet NGVD when deliveries from the WCA's are not being made to CLBSA.
- 4) Outflow structures: (A) 800 cfs pump from the CLBSA to NESRS via a 640-acre STA and the L-30 borrow canal. Deliveries from CLBSA are directed to the WRA/wetland west of the CLBSA prior to discharge to NESRS and/or WCA 3B via the L-30 borrow canal. The pump is operated when water elevations in NESRS trigger deliveries from CLBSA and when water levels in CLBSA are above -15 feet NGVD. (B) The WRA discharges to L-30 borrow canal via an 800 cfs gravity structure. (Stormwater Treatment Area detention time requirements need to be determined. Pretreatment in reservoir may reduce the size requirements of the treatment area.) The structure is operated from 0.5 feet to 4 feet of head as a flow through discharge operated simultaneously with the outflow pump from CLBSA.
- 5) 1400 cfs (also see Dade-Broward Levee Component) structure located upstream of the inflow pump is kept closed except for deliveries to coastal canals and the South Dade Conveyance System. The structure consists of a gated spillway to maintain an upstream stage of 7.0 feet NGVD.

Location: Reservoir is located within the area proposed for rockmining by the Lake Belt Issue Team. It is sited south of the Miami Canal (C-6) and north of the Northwest Wellfield Delivery canal to minimize the impacts to the Northwest Wellfield.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's Northwest Wellfield.
- 2) Treatment facility needed if stored water is backpumped to the Everglades (640-acre STA). Resizing of the treatment facility may be required depending on the treatment technology used.
- 3) All water quality considerations are addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

- 5) Limestone Filter Treatment system within the reservoir may be developed through use of compartmentalization of rockmining excavation pattern.
- 6) Telemetry systems are required for all operable structures and pump stations.

Summary of modifications from D13R: The WPA Team recommends no change in design from Alternative D13R. The preceding component description is that of Alternative D13R. The WPA Team did utilize a revised component configuration during both the Regional and Sub-Regional model runs.

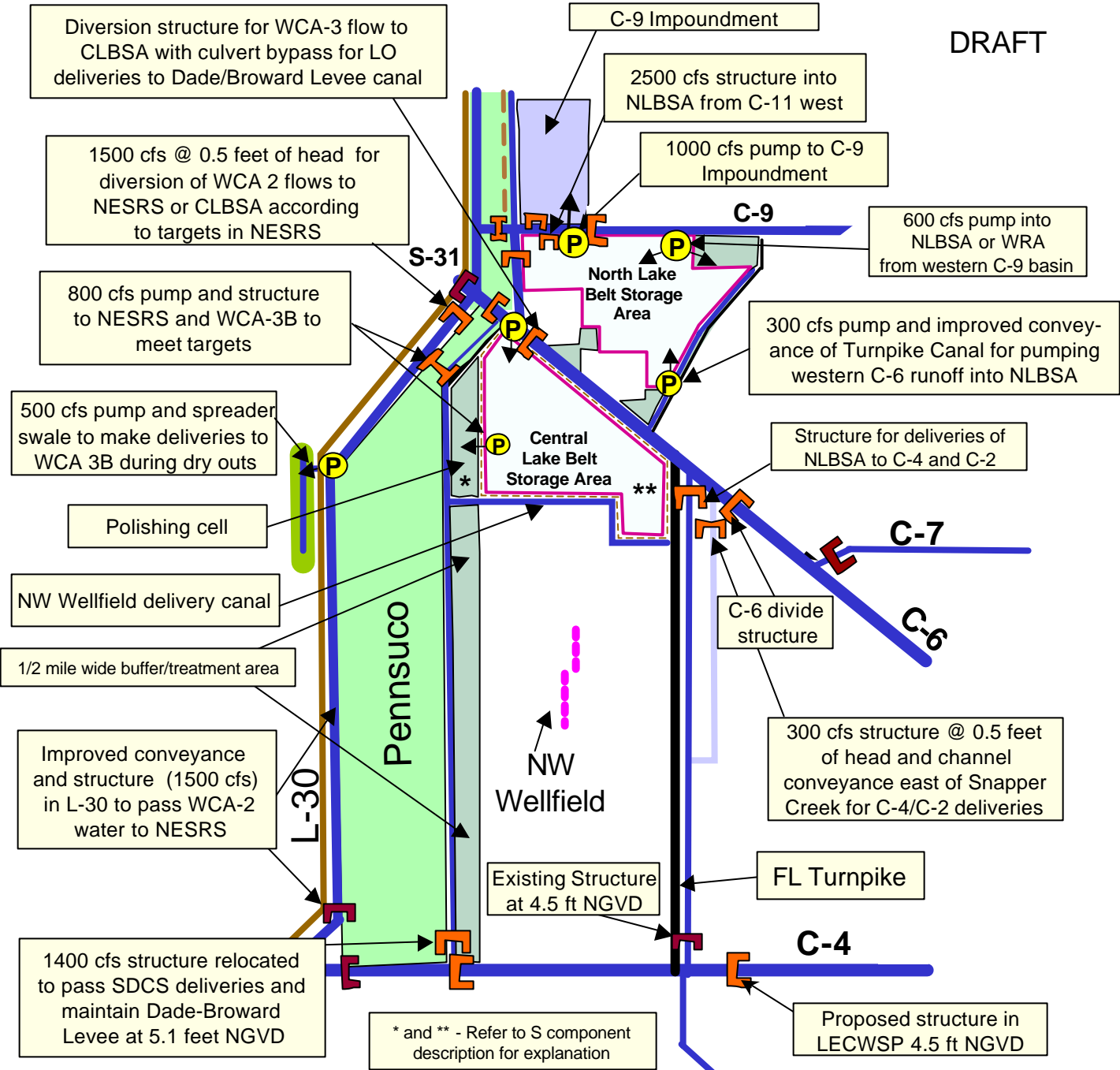
Notes found on Maps 6 and 7:

* Polishing cell/treatment facility location and size are undetermined at this time. In Alternative D13R it was assumed that this area could be excavated and used as storage if the area was not required for treatment.

** Relocation of this section of the storage area may be required to avoid existing infrastructure in this area.

Note: The WPA Team has recommended in the Preliminary Selected Plan the same component design as Alternative D13R. This is due to the many uncertainties with the technology and design. These uncertainties are expected to be resolved during the pilot study for the Lake Belt In-ground Reservoir. The WPA Team did investigate alternative component designs for the Lake Belt components – North Lake Belt Storage Area (XX) and Central Lake Belt Storage Area (S). These alternative designs consolidated the in-ground reservoir locations, revised storage depths and expanded the size of the proposed Water Redistribution Areas. These alternative designs function in a similar manner to the Alternative D13R designs (storage of equivalent volumes of water) and were used in the modeling of the WPA Preliminary Selected Plan. The Lake Belt In-ground Reservoir pilot project may utilize these alternative designs as the starting point for further study and investigation.

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LEGEND

	Existing Canal		Existing Structure
	Proposed Canal		Proposed Structure
	Curtain Wall		Proposed Pump
	Levee		Potential WRA
			In-Ground Storage Area

N
↑
Not to scale

This graphic is a conceptual tool utilized for project development only. This graphic is not self-executing or binding, and does not otherwise affect the interests of any person including any vested rights or existing uses of real property.

WPA Feasibility Study - TENTATIVE SELECTED PLAN
North and Central Lake Belt Storage Areas
WPA Component Map 7

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component BB

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: Dade-Broward Levee and Canal - SEE WPA COMPONENT MAP 7

Purpose: Reduce seepage to the east from the Pennsuco wetlands and southern Water Conservation Area (WCA) 3B and enhance hydroperiods in the Pennsuco. Also, an improved Dade Broward Levee enhances recharge to Miami-Dade County's Northwest Wellfield.

Operation: Improvements to the Dade-Broward Levee and associated conveyance system reduces seepage losses to the east and provide recharge to Miami-Dade County's Northwest Wellfield. Seepage reduction enhances hydroperiods in Pennsuco wetlands and hold stages higher along southeastern WCA 3B. Recharging the conveyance features of the Dade-Broward levee from the regional system deliveries provides recharge to Miami-Dade County's Northwest Wellfield.

Design and operation detail:

- 1) Improve the Dade-Broward Levee: Construct or improve the existing levee to a five-foot height with a twelve-foot top width and an east borrow canal with 14 feet depth, 110-foot bottom width, 1 to 1 (vertical to horizontal) side slopes, and improve existing conveyance to 1400 cfs.
- 2) 600 cfs divide structure in the C-6 Canal for regional system deliveries to C-6, C-7, C-4, and C-2 canals and the South Dade Conveyance System (SDCS). This structure controls the C-6 Canal water levels so that deliveries are directed to the Dade-Broward Levee borrow canal, the Central Lake Belt Storage Area or are released to the canals above.
- 3) 1400 cfs bypass structure and proposed canal from the C-6 Canal to the Dade-Broward Levee Canal to allow Lake Okeechobee deliveries south to provide recharge from the regional system via the improved US Highway 27 west canal.
- 4) 1400 cfs gravity structure in the Dade-Broward Levee borrow canal located on the northern levee of the C-4 Canal. Deliveries are made to maintain a control elevation of 5.1 feet NGVD unless deliveries are being made to the SDCS. Tailwater elevations for this structure during deliveries to the SDCS is 4.5 feet NGVD.

Location: Dade-Broward Levee, Pennsuco Wetlands, WCA 3B, the Central Lake Belt Storage Area and Miami-Dade County's Northwest Wellfield.

Counties: Miami-Dade

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Assumptions and related considerations:

- 1) Wellfield protection must be maintain through recharge of acceptable water quality.
- 2) Secondary structures within the recharge canals may be needed to provide seepage reduction and wellfield recharge desired.
- 3) The stage maintained in the Dade-Broward Levee conveyance canal is subject to change.

Summary of modifications from D13R: Relocate the gravity structure in the Dade-Broward Levee borrow canal south to the northern levee of the C-4 Canal. Send Lake Okeechobee water supply deliveries south via the Dade-Broward Levee borrow canal instead of further east along the turnpike canal. Control elevation is increased to 5.1 feet NGVD.

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Water Preserve Area Feasibility Study – Tentative Selected Plan

Component T

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: C-4 Control Structure

Purpose: Proposed structure to reduce regional system water supply deliveries by diverting dry season stormwater flows to the C-2 Canal to increase recharge in several nearby coastal wellfields.

Operation: The structure diverts dry season stormwater flows from the western C-4 basin to the C-2 Canal to recharge the wellfields in the eastern C-2 basin.

Design and operation detail:

Control structure - An operable lift-gate with an overflow elevation of 4.5 feet NGVD and a capacity of approximately 600 cfs (final design specifications will be determined in future detailed design and hydrologic and hydraulic modeling).

Location: In the C-4 Canal, just downstream of the confluence of the C-2 and C-4 canals.

Assumptions and related considerations:

- 1) Benefits to WCA 3B associated with improved C-4 seepage control are directly related to the proposed G-356 pumpage (Modified Water Deliveries).
- 2) Head losses across the proposed structure do not inhibit passing flood releases when necessary.
- 3) A pump may be associated with the west C-4 structure if back pumping the C-4 basin runoff to the Bird Drive Recharge Area becomes a component of the final alternative.

Summary of modifications from D13R: No change from D13R.